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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,092	03/04/2002	Simone Renoldi	SP01-068	5888

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EXAMINER	
KAO, CHIH CHENG G	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 11/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,092	RENOLDI ET AL.	
	Examiner	Art Unit	
	Chih-Cheng Glen Kao	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 June 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

2. The drawings were received on 6/21/04. These drawings are acceptable.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5, 6, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. ("Low-Loss Design Method for a Planar Dielectric-Waveguide Y Branch: Effect of a Taper of Serpentine Shape") in view of Tanaka et al. ("Glass Waveguide 1 X N Branching Devices).

4. Regarding claim 1, Tsuji et al. discloses a junction (Fig. 9) comprising first (Fig. 9, left waveguide), second, and third (Fig. 9, right waveguides) optical waveguides (Title), a transition portion in which second and third waveguides branch from the first, comprising a bifurcation

discontinuity of width (Fig. 9, left-end gap between the two right waveguides), wherein the width of the first waveguide (Fig. 9, right-end width of left waveguide) is less than the sum of the widths of the second and third waveguides and the discontinuity (Fig. 9, left-end width of two right waveguides and the width of the gap), and wherein the first waveguide extends to the discontinuity with its width essentially unchanged (Figs. 1, 9, and 10, left waveguide).

However, Tsuji et al. does not seem to specifically disclose a substrate.

Tanaka et al. teaches a substrate (Summary).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to modify the device of Tsuji et al. with the substrate of Tanaka et al., since one would be motivated to incorporate it for reinforcement, which improves mechanical and thermal stability (Summary) as shown by Tanaka et al.

5. Regarding claim 2, Tsuji et al. further discloses the discontinuity greater than 0.2 μm (Fig. 9, width of gap relative to "15W").

6. Regarding claim 3, Tsuji et al. further discloses a separate region between the second and third waveguides (Fig. 9, region between the two right waveguides), which would necessarily have a refractive index lower than the refractive index of the second and third waveguides in order to propagate light along the waveguides.

7. Regarding claim 5, Tsuji et al. further discloses the separation region width increasing progressively away form the first waveguide (Fig. 9, width of region between the two right waveguides).

8. Regarding claim 6, Tsuji et al. in view of Tanaka et al. suggests a device as recited above.

However, Tsuji et al. does not disclose the width of second and third waveguides increasing progressively in a transition portion away from a first waveguide.

Tanaka et al. further discloses the width of second and third waveguides increasing progressively in a transition portion away from a first waveguide (Fig. 1B, width of the two upper waveguides away from the lower waveguide).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further modify the device of Tsuji et al. with the second and third waveguide widths of Tanaka et al., since one would be motivated to incorporate this to reduce scattering losses in the branching region (Page 887, col. 2, lines 14-18) as shown by Tanaka et al.

9. Regarding claim 9, Tsuji et al. further discloses the waveguides adapted to allow propagation of a single mode (Abstract).

10. Regarding claim 10, Tsuji et al. further discloses the second and third waveguides branching from the first waveguide in an essentially symmetrical way (Fig. 9).

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al. as applied to claim 1 above, and further in view of Paatzsch et al. (WO 97/32228).

Tsuji et al. in view of Tanaka et al. suggests a device as recited above.

However, Tsuji et al. does not disclose a width of a separation region essentially constant throughout the transition portion.

Paatzsch et al. teaches a width of a separation region essentially constant throughout the transition portion (Fig. 2, #3 and 5, and Abstract).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al. with the separation region width of Paatzsch et al., since one would be motivated to incorporate this to keep attenuation in the coupler low (Abstract) as shown by Paatzsch et al.

12. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al. as applied to claim 6 above, and further in view of Nakai (JP 9-230151).

Tsuji et al. in view of Tanaka et al. suggests a device as recited above.

However, Tsuji et al. does not disclose the sum of widths of second and third waveguides and the discontinuity exceeding the width of the first waveguide by a quantity in the range from 15% to 35%.

Nakai teaches the sum of widths of second and third waveguides and the discontinuity exceeding the width of the first waveguide by a quantity in the range from 15% to 35% (Fig. 1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al. with the sum of widths of Nakai, since one would be motivated to incorporate this to keep the device small and improve productivity and yield (Abstract) as shown by Nakai.

13. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al. as applied to claim 1 above, and further in view of Burns (US Patent 4070092).

Tsuji et al. in view of Tanaka et al. suggests a device as recited above.

However, Tsuji et al. does not disclose a substrate made from lithium niobate.

Burns teaches a substrate made from lithium niobate (col. 2, lines 31-48).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al. with the lithium niobate substrate of Burns, since one would be motivated to incorporate this for more easily raising the index of refraction in a selected area to send light across a substrate (col. 2, lines 45-48) as implied from Burns.

14. Claims 12-17, 20, 23, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al. (JP 58-211106), and Tangonan (US Patent 4375312).

15. Regarding claims 12, 13, and 20 and for purposes of being concise, Tsuji et al. in view of Tanaka et al. and Burns suggests a method as recited above.

However, Tsuji et al. does not disclose a first material having a refractive index, depositing a first layer of second material, depositing a second layer of photosensitive material, exposing to mark out a profile to be integrated, eliminating a portion of the second material outside the profile, providing a mask facing the second layer with a transparent region to radiation for delimiting a structure corresponding to the structure, and a second material capable of increasing the refractive index in the substrate.

Sawaki et al. teaches (Abstract) a first material having a refractive index (Fig. 1, #1), depositing a first layer of second material, depositing a second layer of photosensitive material, exposing to mark out a profile to be integrated, and eliminating a portion of the second material outside the profile (Abstract, Constitution, and Figure 1). Tangonan teaches providing a mask facing the second layer with a transparent region to radiation for delimiting a structure corresponding to the structure (col. 3, lines 64-68). Burns further teaches a second material capable of increasing the refractive index in the substrate (col. 2, lines 45-48).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested method of Tsuji et al. in view of Tanaka et al. and Burns et al. with the steps of forming a structure of Sawaki et al., since one would be motivated to incorporate them to better prevent diffusion of a diffusion source to outside a desired area (Abstract, Purpose) as implied from Sawaki et al.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested method of Tsuji et al. in view of Tanaka et al. and

Burns et al. with providing a mask of Tangonan, since one would be motivated to incorporate this to better define the geometry of the structure onto the resist (col. 3, lines 64-68) as shown by Tangonan.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further modify the suggested method of Tsuji et al. in view of Tanaka et al. and Burns et al. with the second material increasing the refractive index of the substrate, since one would be motivated to incorporate this to better define the direction the light will be traveling through the substrate (col. 2, lines 31-48) as implied from Burns.

16. Regarding claims 14 and 15, Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan suggests a method as recited above.

However, Tsuji et al. does not disclose diffusing at 900°C to 1150°C.

Sawaki et al. further teaches diffusing at 900°C to 1150°C (Abstract, Constitution).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further modify the suggested method of Tsuji et al. in view of Tanaka et al., Burns et al., Sawaki et al., and Tangonan with the diffusion temperature, since one would be motivated to incorporate this as part of a method to better prevent diffusion of a diffusion source to outside a desired area (Abstract, Purpose) as implied from Sawaki et al.

17. Regarding claims 16 and 17, Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan suggests a method as recited above.

However, Tsuji et al. does not disclose lithium niobate and titanium.

Sawaki et al. further teaches lithium niobate and titanium (Abstract, Constitution).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to further modify the suggested method of Tsuji et al. in view of Tanaka et al., Burns et al., Sawaki et al., and Tangonan with lithium niobate and titanium, since one would be motivated to incorporate these materials as part of a method and waveguide to better prevent diffusion of a diffusion source to outside a desired area (Abstract, Purpose) as implied from Sawaki et al.

18. Regarding claim 23, Tsuji et al. further discloses the separation region width increasing progressively away form the first waveguide (Fig. 9, width of region between the two right waveguides).

19. Regarding claim 26, Tsuji et al. further discloses the truncation greater than 0.2 μm (Fig. 9, width of gap relative to "15W").

20. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan as applied to claim 13 above, and further in view of Schaffner (US Patent 5548668).

Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan suggests a method as recited above.

However, Tsuji et al. does not disclose a first layer having a thickness of 50 nm to 150 nm.

Schaffner teaches a first layer having a thickness of 50 nm to 150 nm (Fig. 11a and col. 6, lines 57-63).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan with the first material thickness of Schaffner, since one would be motivated to incorporate this to provide enough titanium to create a waveguide (Fig. 11a) as implied from Schaffner.

21. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan as applied to claim 20 above, and further in view of Paatzsch et al.

Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan suggests a device as recited above.

However, Tsuji et al. does not disclose a width of a separation region at least equal and essentially constant throughout the transition portion.

Paatzsch et al. teaches a width of a separation region at least equal and essentially constant throughout the transition portion (Fig. 2, #3 and 5, and Abstract).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan with the separation region width of Paatzsch et al., since one would be motivated to incorporate this to keep attenuation in the coupler low (Abstract) as shown by Paatzsch et al.

22. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan as applied to claim 20 above, and further in view of Nakai.

Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan suggests a device as recited above.

However, Tsuji et al. does not disclose the sum of widths of second and third waveguides and the truncation exceeding the width of the first waveguide by a quantity in the range from 15% to 35%.

Nakai teaches the sum of widths of second and third waveguides and the truncation exceeding the width of the first waveguide by a quantity in the range from 15% to 35% (Fig. 1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the suggested device of Tsuji et al. in view of Tanaka et al., Burns, Sawaki et al., and Tangonan with the sum of widths of Nakai, since one would be motivated to incorporate this to keep the device small and improve productivity and yield (Abstract) as shown by Nakai.

Response to Arguments

23. Objections to the drawings and specification in the Office Action mailed 3/26/04 have been withdrawn in light of the Amendment filed 6/21/04.

24. Applicant's arguments filed 6/21/04 have been fully considered but they are not persuasive.

Regarding section A. (i) in the Applicant's arguments and in response to Applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., straight arms of the Y-branch) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. Secondly, distinct dislocations or truncations (Fig. 9(a), dislocation or truncation between the two right waveguides) are found in Tsuji et al. Regarding section A. (ii), Applicant argues that the separation of arms would be 50mm, which is several orders of magnitude greater than the prevent invention. The Examiner points out that 50mm is still greater than 0.2 μm. Therefore, the cited art does teach or suggest the claimed invention, and the claims remain rejected over the cited art.

Regarding section B, Applicant argues that the discontinuity shown in Paatzsch et al. is similar to that shown in Applicant's Figure 2. The Examiner disagrees. The discontinuity shown in Paatzsch et al. is similar to that shown in Applicant's Figure 4. Therefore, the cited art does teach or suggest the claimed invention, and the claims remain rejected over the cited art.

Regarding section C and in response to Applicant's argument that the waveguide of Nakai is fundamentally different and not claimed, the claims as noted by the Examiner are open-ended and do not exclude additional, unrecited elements. Therefore, the cited art does teach or suggest the claimed invention, and the claims remain rejected over the cited art.

Regarding section D, Applicant argues that Burns does not have the discontinuity or truncation as per the claimed invention. The Examiner relies on Burns for its teaching of lithium

niobate. The discontinuity or truncation as per the claimed invention has already been taught or suggested by the cited art noted above. Therefore, the cited art does teach or suggest the claimed invention, and the claims remain rejected over the cited art.

Regarding sections E-H, the Examiner's arguments are analogous to the arguments presented in section D. Therefore, the cited art does teach or suggest the claimed invention, and the claims remain rejected over the cited art.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (571) 272-2492. The examiner can normally be reached on M - F (9 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gk

DAVID V. BRUCE
PRIMARY EXAMINER